

Remarks

New claims 23-26 have been added and claims 4, 6 and 7 were previously cancelled. Accordingly, claims 1-3, 5 and 8-26 are currently pending.

I. Amendments:

New claim 23 depends from claim 16 and recites that the at least one other kind of ethylenically unsaturated monomers are selected from the group consisting of alkyl esters of acrylic acid or methacrylic acid. Support for this claim can be found in previously presented claim 8. Accordingly, no new matter has been added.

New claim 24 depends from claim 23 and recites that the anionic stabilizer is a condensed naphthalene sulfonate. Support for this claim can be found in the specification at page 6, line 25. No new matter has been added.

New claims 25 and 26, depend from claims 24 and 1, respectively, and recite that the at least one cellulose non-reactive sizing agent copolymer has a weight average molecular weight greater than 50,000. Support for these claims can be found in the specification at page 7, lines 25-26. No new matter has been added.

II. The Invention:

The present invention relates to an aqueous dispersion useful for internal or surface sizing, as well as preparation and use thereof in the production of paper. The aqueous dispersion includes at least one cellulose reactive sizing agent selected from the group consisting of ketene dimers and multimers, at least one cellulose non-reactive sizing agent (claim 20) and specifically such a sizing agent selected from the group consisting of copolymers of styrene or substituted styrene with at least one other kind of ethylenically unsaturated monomer (claims 1, 5, 8, 17 and 19), and at least one emulsifier selected from the group consisting of oxyalkylene phosphate esters and salts thereof. In other embodiments the dispersion also includes at least one cationic organic compound having a weight average molecular weight less than about 10000 and at least one anionic stabilizer (claim 13), and specifically a cationic organic compound that is a surfactant selected from the group consisting compounds having the general formula $R_4N^+ X^-$ (claim 15) and an anionic stabilizer which is a condensed naphthalene sulfonate (claim 24).

It has been found that effective internal and surface sizing can be achieved by using a dispersion comprising both a ketene dimer or multimer and a cellulose non-reactive sizing agent, and that high stability of such dispersions can be obtained by including a special kind of emulsifier, namely, an oxyalkylene phosphate ester or a salt thereof.

Examples 1 and 2 of the present application show that the present sizing dispersion gives considerably improved sizing efficiency than conventional internal or surface sizes. Examples 3 and 4 further show that the present sizing dispersion has improved stability and particle size distribution, due to the presence of the emulsifier, as claimed.

III. Objections/Rejections:

Claims 1-3, 5 and 8-22 stand rejected, under 35 U.S.C. §103(a), as being unpatentable over Frölich et al (US 6,306,255), in view of Dilts et al (US 6,576,049) and further in view of Wendel et al (US 4,051,093). The Applicant respectfully traverses.

Frölich et al disclose a sizing composition comprising a cellulose-reactive sizing agent and a hydrophobically modified dispersing agent, and optionally a non-cellulose reactive sizing agent. The presently claimed invention is distinguished from Frölich et al by the presence of copolymers of styrene or substituted styrene and an emulsifier selected from the group consisting of oxyalkylene phosphate esters and salts thereof, which has been found to solve the problem of providing a dispersion of high stability.

Dilts et al disclose a sizing composition comprising ASA, AKD or rosin, an emulsion stabilizer and a hydrophobic substance and optionally a surfactant. Applicant respectfully submits that ethoxylated phosphate esters are mentioned as a possible surfactant, this is only one of a vast number of different kinds of surfactants recited and there is no suggestion that such a surfactant is particularly suitable for emulsifying ketene dimers or multimers. Moreover, due to the unpredictable nature of dispersion/emulsion chemistry and the fact that the surfactants disclosed by Dilts et al are meant for a specific sizing emulsion that includes specific types of stabilizers and hydrophobic substances in addition to the recited sizing agent, one of ordinary skill in the art would have no reason to pick ethoxylated phosphate esters from the vast list of surfactants and substitute such a surfactant for the surfactants identified by Frölich et al. Further, Applicant is unaware of any disclosure, teach or suggestion by Dilts of polymeric sizing agents, as presently claimed.

Wendel et al disclose a copolymer emulsion which may be used as a sizing agent for paper (column 6, lines 13-14; claim 1). Wendel et al teach that the emulsion does not need an emulsifier, but do disclose a number of conventional cationic, anionic, amphoteric and non-ionic emulsifiers (column 5, lines 2-24) that can be optionally included. If nevertheless present, Wendel et al teach that cationic emulsifiers are preferred. Although alkyl phosphates are mentioned, this is only one of a vast number of different kinds of surfactants recited. Further,

there is not the slightest indication that any of the emulsifiers mentioned could be used for a dispersion comprising ketene dimers or multimers. Moreover, Applicant is unaware of any disclosure, teaching or suggestion by Wendel et al of a combination of a cellulose reactive sizing agent selected from ketene dimers or multimers and a cellulose non-reactive sizing agent, as presently claimed.

The Office Action contends that it would have been obvious to use the claimed styrene co-polymers as the non-cellulose reactive sizing agent in the composition and method of Frölich et al in view of Dilts et al and further in view of Wendel et al. Applicant respectfully disagrees.

First, Frölich et al does not disclose combination of ketene dimers or multimers with polymeric non-cellulose reactive sizing agents and even less with co-polymers of styrene or substituted styrene. Applicant respectfully submits that a person skilled in the art would have no reason to expect that a combination of ketene dimers or multimers with co-polymers of styrene or substituted styrene would give any improved effect.

Second, both Dilts et al and Wendel et al are very general in respect of possible emulsifiers and do certainly not point at ethoxylated phosphate esters as being preferred. Picking a very narrowly defined group of emulsifiers among the vast number of emulsifiers recited in the prior art could not have been obvious to a person skilled in the art in the absence of any particular reason to do so. In the present case there was no reason to believe that the instantly claimed group of emulsifiers would be efficient for stabilizing compositions comprising a mixture ketene dimers or multimers with co-polymers of styrene or substituted styrene.

It is respectfully submitted that the cited references merely disclose the possibility of using any emulsifier selected from a broad range of different emulsifiers, as discussed above, without any suggestion to modify their teachings to arrive at the claimed invention. A "determination of obviousness cannot be based on the hindsight combination of components selectively culled from the prior art to fit the parameters of the patented invention." *Crown Operations*, 62 U.S.P.Q.2d at 1922 (*quoting ATD Corp. v. Lydall, Inc.*, 159 F.3d 534, 546, 48 U.S.P.Q.2d 1321, 1329 (Fed. Cir. 1998)). There must be a teaching or suggestion in the prior art, within the nature of the problem to be solved, or within the general knowledge of a person of ordinary skill in the field of the invention, to look to particular sources, to select particular elements, and to combine them as combined by the inventor. *Id.* at 1922. In *Grain Processing Corp. v. American Maize-Prods. Co.*, 840 F.2d 902, 907 (Fed. Cir. 1988), the Federal Circuit warned that care must be taken to avoid hindsight reconstruction by using the present application as a guide through the

maze of prior art references, combining the right references in the right way so as to achieve the result of the claimed invention.

Regarding the instant case, Applicant submits that there is no reason based on the cited references to combine them in the manner presently claimed and the only reason one skilled in the art would arrive at the presently claimed invention is using the present application as a blueprint. In that regard, Applicant submits that ketene dimers and multimers are structurally quite different from copolymers of styrene or substituted styrene and a person of ordinary skill in the art would have no reason to expect that an emulsifier efficient for styrene polymers would be efficient also for a mixture of the two different kinds of sizing agents.

Applicant respectfully submits that, in order to obtain the dispersion as presently claimed, which includes using specific emulsifiers for the claimed dispersion (that includes both the specific cellulose reactive and cellulose non-reactive sizing agents), one would have to pick and choose individual aspects from the various teachings in the cited references and then select the specific claimed emulsifier, in the absence of any teachings or suggestions to do so. It is respectfully submitted that the only way to accomplish this, is with the improper use of hindsight.

Although Frölich et al disclose a combination of a cellulose-reactive sizing agent and cellulose non-reactive sizing agent, Applicant respectfully submits that there is no teaching or suggestion that a dispersion of high stability could be obtained by selecting an emulsifier as presently claimed. It is further submitted that there is no guidance on how to select an emulsifier from among the thousands of emulsifiers known per se, including those mentioned in Wendel et al, in order to provide a stabile dispersion, as claimed.

Wendel et al disclose among other emulsifiers anionic emulsifiers such as alkyl sulfates, alkyl-sulfonates and alkyl-phosphates which may be in the in the form of adduct with ethylene oxide (column 5, lines 12-15). However, Applicant respectfully submits that there is no teaching or suggestion that oxyalkylene phosphate esters or salts thereof would be suitable for stabilizing a dispersion that includes both a ketene dimer or multimer and a cellulose non-reactive sizing agent.

Wendel et al teach that it is not necessary to have emulsifiers present in the process of emulsion polymerization in an aqueous medium containing conventional polymerization initiators to obtain shear-resistant emulsions (column 4, line 65- column 5, line 2). Wendel et al further teach that cationic emulsifiers are preferable, such as salts of fatty amines (column 5, line 4). However, Applicant has found that use of an emulsifier, as claimed, results in an unexpected

improvement in stability of the dispersion compared to use of only a salt of a fatty amine. See Example 3, where use of a polyoxyethylene phosphate ester improved stability of the dispersion compared to using just a ditallow dimethyl ammonium chloride. Moreover, a person of ordinary skill in the art would have no reason to expect any improved effect of combining the two different kinds of sizing agents, as demonstrated in Examples 1-2 in the present specification.

The Office Action indicates that the results (in the present examples) are not commensurate in scope with the broadly claimed subject matter. Applicant respectfully disagrees and submits that the unexpected results are commensurate in scope with the present claims and certainly with new claims 24 and 25.

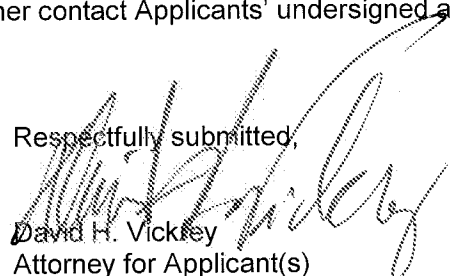
Applicant respectfully submits that the cited references, when read as a whole do not, disclose, suggest or teach that it would be possible or desirable to select an emulsifier, as presently claimed, for stabilizing a dispersion that includes both a ketene dimer or multimer and a styrene cellulose non-reactive sizing agent. Therefore, it is respectfully submitted that the presently claimed invention is not obvious in view of these cited references.

Accordingly, it is respectfully requested that the rejections of claims 1-3, 5 and 8-22 under 35 U.S.C. § 103(a), as being obvious over Frolich et al, in view of Dilts et al and further in view of Wendel et al, be withdrawn.

IV. Conclusion:

In light of the foregoing, Applicant respectfully submits that the application as amended, including claims 1-3, 5 and 8-26, is now in proper form for allowance, which action is earnestly solicited. If the Examiner has any questions relating to this Amendment or to this application in general, it is respectfully requested that the Examiner contact Applicants' undersigned attorney at the telephone number provided below.

Respectfully submitted,


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